

**Helminth Parasites of Some Southern California Fishes with a
Redescription of *Proctoeces magnorus* Manter, 1940
(Digenea: Fellodistomidae) and Description of
Choanodera moseri sp. n.
(Digenea: Apocreadidae)**

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Abstract. — Approximately 1400 marine fishes collected in and around Los Angeles and Long Beach Harbors were examined for parasitic helminths between May 1979–March 1992. Ten families of helminth parasites were collected from 18 species of southern California marine fish that represent new host-parasite records. A new species is described, *Choanodera moseri* sp. n., as well as a redescription of *Proctoeces magnorus* Manter, 1940.

Parasites of southern California marine fishes were surveyed from 1975–1979 (Dailey et al. 1981). During this study, 2268 fishes were examined, primarily for nematodes of the two genera *Anisakis* and *Pseudoterranova* (*Phocanema*). In 1983, Love and Moser published a check list of parasites of marine fishes for the western United States that included southern California species.

During the present study, parasitic helminth were recovered from a total of approximately 1400 marine fishes captured between May 1979–March 1992, in and around the waters of Los Angeles and Long Beach harbors. The results of this investigation, which includes new host-parasite records, a redescription of *Proctoeces magnorus* Manter, 1940 (Digenea: Fellodistomidae) and an original description of a new species of *Choanodera* (Digenea: Apocreadidae) are presented in this paper.

Methods

Fish were collected by trawl aboard the R/V *Yellowfin* for examination by students enrolled in general parasitology at California State University, Long Beach (CSULB). Fish were identified using Miller and Lea (1972), sexed, measured, eviscerated (gills and gut), and packed on ice immediately after capture. Trematodes were fixed in alcohol-formalin-acetic acid (AFA), stained in Semichon's carmine, dehydrated in ethyl alcohol, cleared in xylene, and mounted in balsam resin. Nematodes were killed in hot 70% ethyl alcohol, cleared in glycerin, and mounted in glycerine jelly. Drawings were made with the aid of a drawing tube. Measurements are in micrometers unless otherwise indicated, with ranges followed by means in parentheses.

Results

Eleven families of helminth parasites were collected from 18 species of fishes in southern California waters that represented new host-parasite records (Table

1). Six specimens of *Proctoeces magnorus* were recovered from two California sheephead, *Semicossyphus pulcher* (Ayres) and 11 specimens of *Choanodera moseri* sp. n. were found, four and seven respectively from two barred sand bass, *Paralabrax nubilifer* (Girard) and two ocean whitefish, *Caulolatilus princeps* (Jennyns).

Description

Choanodera moseri sp. n.

(Fig. 1)

Choanodera moseri sp. n. Apocreadidae Skrjabin, 1942. The following description based on 11 specimens (2 adults, 9 immature).

Specific diagnosis.—Body elongate, thick, with widest part at level of acetabulum. Anterior part of worm only slightly tapering, posterior end rounded. Length 0.601 to 2.052 mm (1.247 mm), width 0.281 to 0.595 mm (0.468 mm). Cuticle not covered by spines or scales. Forebody folded in ventrally, forming scoop shaped pocket, flaring anteriorly, coming together just posterior to the acetabulum. Oral sucker subterminal, circular, 71.9 to 156.9 in diameter. Acetabulum circular, sessile, 93.9 to 196.2, slightly wider than long. Pharynx unmodified, 45.3 to 130.8 long by 42.1 to 137.3 wide. Intestinal bifurcation midway between suckers. Cecae end blindly near posterior of body. Genital pore median, just anterior to acetabulum. Testes tandem, intercecal, wider than long. Anterior testes 48.6 to 340.0 wide by 48.6 to 294.3 long. Posterior testes 48.6 to 340.0 wide by 48.6 to 300.6 long. Cirrus and cirrus sac lacking. Seminal vesicle oval, median, extending to just posterior to acetabulum, narrowing to a tubular pars prostitica with well developed prostate gland.

Ovary circular, 22.7 to 163.5 in diameter, anterior to the anterior testis and dextral of midline. Uterus pretesticular, mostly to left of ovary, emptying into genital sinus. Eggs large, 64.8 to 100.44 by 48.6 to 81.0. Seminal receptacle round, median, in pretesticular space, dorsal to, and slightly overlapping ovary and anterior testis. Vitelline follicles large, extending from posterior edge of acetabulum to posterior of body, confluent posterior to testes.

Type host.—Barred Sand Bass, *Paralabrax nebulifer* (Girard).

Location.—Intestine.

Locality.—Long Beach harbor, Long Beach, California.

Holotype.—USNM Helm. Coll. No. 82770.

Etymology.—This species is named in honor of Dr. Mike Moser, University of California, Santa Cruz, for his many contributions to marine parasitology.

Remarks.—The new species is distinct from *C. caulolotili* Manter, 1940, the only other species in this genus, by its smaller body size (0.601–2.052 mm) versus 2.5–3.3 mm for *C. caulolotili*, lack of tegumental spines and shape of ovary (round of *C. moseri* sp. n. and lobed for *C. caulolotili*).

Proctoeces magnorus Manter, 1940

(Fig. 2)

Redescription based on 6 specimens. Body aspinose, cylindrical, equally wide along most of length, 1.456 to 4.882 mm (3.356 mm) long by 0.297 to 0.446 mm (0.350 mm) wide. Oral sucker subterminal, muscular, funnel shaped, 327 to 523

Table 1. New host-parasite records for southern California fishes.

Family	Genus/species	USNM Helm. Coll. #	Host
Digenea			
Acanthocolpidae	<i>Stephanostomum casum</i>	82779	California halibut (<i>Paralichthys californicus</i>)
Allocreadidae	<i>Genitocotyle acirrus</i>	82780	White croaker (<i>Genyonemus lineatus</i>)
	<i>Helicometrina nimia</i>	82773	Starry rockfish (<i>Sebastes constellatus</i>)
Apocreadidae	<i>Choanodera moseri</i> sp. nov.	82770	Barred sand bass (<i>Paralabrax nebulifer</i>) Ocean whitefish (<i>Caulolatilus princeps</i>)
Felodistomidae	<i>Proctoeces magnorus</i>	82778	California sheephead (<i>Semicossyphus pulcher</i>)
Gorgoderidae	<i>Proboliurema californiense</i>	82777	Thornback ray (<i>Platyrhinoides triseriata</i>)
Hemiuridae	<i>Parahemiurus merus</i>	82772	Deepbody anchovy (<i>Anchoa compressa</i>)
Opecoelidae	<i>Opecoelus lotellae</i>	82774	California sheephead (<i>Semicossyphus pulcher</i>) Scorpion fish (<i>Scorpena guttata</i>)
	<i>Opecoelina scorpaenae</i> *	82775	Garibaldi (<i>Hypsypops rubicundus</i>) White croaker (<i>Genyonemus lineatus</i>)
	<i>Opecoelina scorpaenae</i> *	82776	California sheephead (<i>Semicossyphus pulcher</i>)
Monogenea			
Microcotylidae	<i>Microcotyle sebastes</i>	82771	Green rockfish (<i>Sebastes rastrellager</i>) Pile surf perch (<i>Paralichthys vacca</i>) Shortspine thornyhead (<i>Sebastolobus alascanus</i>) Speckled rockfish (<i>Sebastes ovalis</i>) Starry rockfish (<i>Sebastes constellatus</i>)
Nematoda			
Camallanidae	<i>Spirocamallanus pereirai</i>	82781	Round herring (<i>Etrumeus acuminatus</i>) Speckled fin midshipman (<i>Porichthys myriastes</i>) Queenfish (<i>Seriphus politus</i>) White croaker (<i>Genyonemus lineatus</i>)
	<i>Spirocamallanus pereirai</i> (larvae)		Topsmelt (<i>Atherinops affinis</i>)

* New locality record.

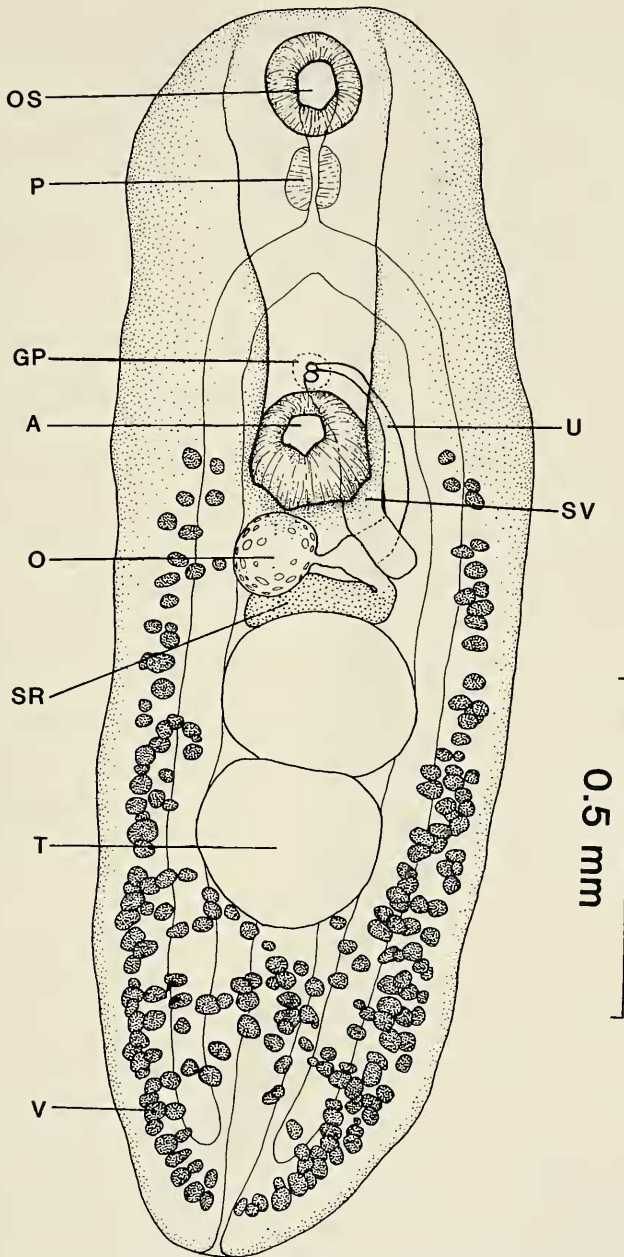


Fig. 1. Line drawing of *Choandera moseri* from composite of immature and mature specimens. A, acetabulum; GP, genital pore; O, ovary; OS, oral sucker; P, pharynx; SR, seminal receptacle; SV, seminal vesicle; T, testis; U, uterus; V, vitellaria.

deep by 359 to 497 wide. Acetabulum pedunculate, 255 to 359 long by 261 to 327 wide, with muscular groove within cavity (not apparent in all specimens). Prepharynx short; pharynx large, very muscular, 233 to 366 long by 117 to 281 wide. Cecae conspicuous, reaching posterior end of body. Intestinal bifurcation

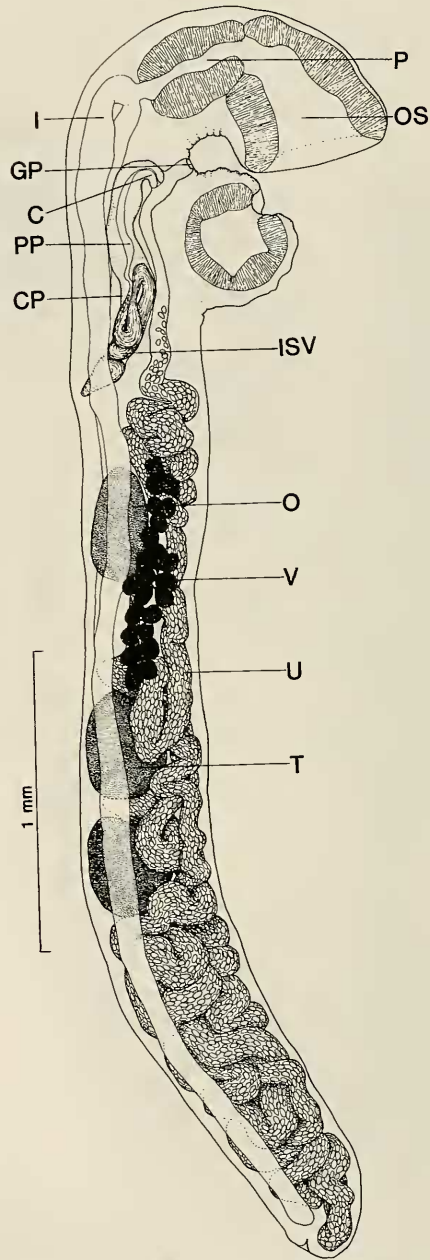


Fig. 2. Line drawing of mature *Proctoeces magnorus*. C, cirrus; CP, cirrus pouch; I, intestine; ISV, internal seminal vesicle; GP, genital pore; O, ovary; OS, oral sucker; P, pharynx; PP, pars prostitica; T, testis; U, uterus; V, vitellaria.

just posterior to pharynx. Genital pore median, anterior to acetabulum stalk, posterior to intestinal bifurcation. Testes oval, diagonal, separated by a few folds of uterus, in posterior half of body, 155 to 385 long by 119 to 281 wide. Cirrus sac claviform, extending to half way between ovary and acetabulum in relaxed

specimens, just posterior to acetabulum in contracted specimens, 392 to 810 long by 65 to 98 wide at greatest width (near base). Posterior portion of seminal vesicle sac like, separated from anterior coiled tubular portion by a constriction. Pars prostitica long, cirrus short, empties into anterior part of a large genital atrium. Ovary oval, pretesticular, 61 to 379 long by 64 to 255 wide, separated from anterior testes by a few coils of uterus. Seminal receptacle seen only in small immature worms, at level of, or slightly posterior to ovary. Uterus extends to and fills posterior portion of body, empties into genital atrium. Eggs small, 19 by 35. Vitelline follicles few, in two lateral groups extending from anterior edge of ovary to anterior testis.

Host. — California Sheephead, *Semicossyphus pulcher* (Ayres).

Location. — Intestine.

Locality. — Long Beach harbor, Long Beach, California.

Voucher specimen. — USNM Helm. Coll. No. 82778.

Remarks. — Freeman and Llewellyn (1958) synonymized *P. eurythreus* Odhner, 1911 with *P. subtenuis* (Linton, 1907) Hanson, 1950 and concluded that *P. magnorus* was a synonym of *P. subtenuis* (=syn. *P. eurythreus*). Gibson and Bray (1980) placed *P. magnorus* as species inquerendi until more specimens were described. Our specimens compare well with Manter's (1940) original description (USHM #9359), except in three areas: 1. The musculature of the oral sucker is much more distinct in our specimens. 2. The internal seminal vesicle is longer and separated into a sac like posterior section and a coiled tubular anterior portion, and 3. The ovary and testis of our specimens are oval rather than spherical as in Manter's specimen. Since differences within species of *Proctoeces* can be very large (Gibson and Bray 1980; Bray 1983), the variation seen between our specimens and that of Manter, is probably due to variations within the species. Based on this, we concur with Manter (1940) that *P. magnorus* is indeed a distinct species.

Discussion

Opecoelina scorpaenae Manter, 1934 (Table 1) has not been recorded from any west coast fishes prior to this study (Love and Moser 1983; Gibson and Bray 1984). We found *O. scorpaenae* in three different hosts (Table 1), the California sheephead, *Semicossyphus pulcher* (Ayres), garibaldi, *Hypsypops rubicundus* (Girard), and the white croaker, *Genyonemus lineatus* (Ayres), which suggests that this parasite is common and wide spread.

Sekerak and Arai (1977) reported that specimens of *Stephanostimum casum* (Linton, 1910) found from inshore species of rockfish from the north-eastern Pacific were really *S. californicum* Manter and Van Cleave, 1951 and agreed with Durio and Manter's (1969) assumption that *S. casum* is restricted to tropical waters. *Stephanostimum casum* has been found in fish from the Caribbean, Bermuda, the Mexican Pacific, Galapagos Islands, and the Red Sea (Durio and Manter 1969). Our specimen (Table 1), from the California halibut, *Paralichthys californicus* (Ayres) caught in southern California may represent the northern most extent of *S. casum*'s range.

Parahemiurus merus (Linton, 1910) Manter, 1940 is widely distributed in the Gulf of Mexico, Atlantic and Pacific Oceans, as well as Japanese waters, where it is found mostly in carangid, salmonid, clupeid, and engraulid fishes (Bray 1990). *Parahemiurus merus* was reported from 19 species of fish from the western Pacific

Ocean (Love and Moser 1983). The deepbody anchovy, *Anchoa compressa* (Girard) is a new host record for this parasite (Table 1). One other host in the family Engraulididae from southern California, the northern anchovy, *Engraulis mordax* (Girard), has also been found to be infected with *P. merus* (Woolcock 1935). Bray (1990) suggested that *P. merus* could play an important role as a biological indicator. Due to the economic and commercial importance of *A. compressa* and *E. mordax*, and its wide spread prevalence, *P. merus* may make an important biological marker for the management of these fisheries. *Parahemiurus merus*, for example, is used as a marker for the migration of masu salmon, *Oncorhynchus masu* in Japan (Awakuru and Nomura 1983) as well as a stock indicator for the Pacific herring, *Clupea harengus pullasi* in central California (Moser and Hsieh 1992).

Another potentially important biological indicator may be the monogene, *Microcotyle sebastes* Goto 1984, since it is found on the gills in a large number of hosts (Love and Moser 1983). Five new hosts were found to be infected with this parasite (Table 1). Two of the hosts, the starry rockfish, *Sebastes constellatus* (Jordan and Gilbert) and the shortspine thornyhead, *Sebastolobus alascanus* Bean are fished commercially in southern California (Eschmeyer et al. 1983). *Microcotyle sebastes* reach very high levels of infection in the bocaccio. *Sebastes paucispinis* Ayres (Jensen et al. 1982) and may present a potential health problem for stocks of rockfish, a very important component of the sport and commercial fishery in southern California (Eschmeyer et al. 1983).

Nobel and King (1959) listed five new host records for the nematode *Spirocamallanus pereirai* Annereaux, 1946 from southern California. Our study includes four new hosts from southern California waters (Table 1): the round herring, *Etrumeus acuminatus* (Dekay), speckledfin midshipman, *Porichthys myriaster* (Hubbs and Schultz), queenfish, *Seriphus politus* (Ayres), and the white croaker, *Genyonemus lineatus*. Third stage larvae of *S. pereirai* were also found in the intestines of topsmelt, *Atherinops affinis* (Ayres) collected in Malibu Lagoon, Malibu, California.

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Literature Cited

- Annereaux, R. R. 1946. A new nematode, *Procamallanus pereirai*, L. with a key to the genus. Trans. Amer. Micr. Soc., 65:299-303.
- Awakura, T., and T. Nomura. 1983. Studies of parasites of marine salmon, *Oncorhynchus masu*—VI. Hemiurid trematodes found in alimentary tract. Sci. Reports of the Hokkaido Fish Hatchery, 38:39-46.
- Bray, R. A. 1983. On the fellodistomid genus *Proctoeces* Odhner, 1911 (Digenea), with brief comments on two other fellodistomid genera. J. Nat. Hist., 17:321-339.
- . 1990. A review of the genus *Parahemiurus* Vas & Pereira, 1930 (Digenea: Hemiuridae). Systematic Parasitology, 15:1-21.
- Dailey, M. D., L. A. Jensen, and B. W. Hill. 1981. Larval anisakine roundworms of marine fishes from southern and central California, with comments on public health significance. Calif. Fish and Game, 67(4):240-245.
- Durio, W. O., and H. W. Manter. 1969. Some digenetic trematodes of marine fishes of New Caledonia.

III. Acanthocolpidae, Haploporidae, Gyliuchenidae, and Cryptogonimidae. *J. Parasit.*, 55(2): 293-300.

- Eschmeyer, W. N., E. S. Herald and H. Hammann. 1983. Peterson field guides: Pacific coast fishes. Houghton Mifflin Company, Boston, Massachusetts, 355 pp.
- Freeman, R. F. H., and J. Llewellyn. 1958. An adult digenetic trematode from an invertebrate host: *Proctoeces subtenuis*. *J. Mar. Bio. Ass. U.K.*, 43:113-123.
- Gibson, D. I., and R. A. Bray. 1980. The Fellodistomidae (Digenea) of fishes from the north east Atlantic. *Bull. British Mus. Nat. Hist.*, 37(4):259-293.
- . 1984. On *Anomalotrema* Zhukov, 1957, *Pellamyzon* Montgomery, 1957, and *Opecoelina* Manter, 1934 (Digenea: Opecoelidae), with a description of *Anomalotrema koiae* sp. nov. from north Atlantic waters. *J. Nat. Hist.*, 18:949-964.
- Jensen, L. A., R. A. Heckmann, M. Moser, and M. M. Dailey. 1982. Parasites of Bocaccio, *Sebastes paucispinis*, from southern and central California. *Proc. Helminthol. Soc. Wash.*, 49(2):314-317.
- Love, M. S., and M. Moser. 1983. A checklist of parasites of California, Oregon, and Washington marine and estuarine fishes. NOAA Technical Report. NMFS SSRF-777. U.S. Dept. of Commerce.
- Manter, N. W. 1940. Digenetic trematodes of fishes from the Galapagos Islands and the neighboring Pacific. *Allan Hancock Pacif. Exped.*, 2(14):329-496.
- Miller, D. J., and R. N. Lea. 1972. Guide to the coastal marine fishes of California. Fish Bull. no. 157. Cal. Dept. Fish and Game, Sacramento, California.
- Moser, M., and J. Hsieh. 1992. Biological tags for stock separation in Pacific herring, *Clupea harengus pullasi* in California. *J. Parasit.*, 78(1):54-60.
- Nobel, R. R., and R. E. King. 1960. The ecology of the fish *Gillichthys mirabilis* and one of its nematode parasites. *J. Parasit.*, 46:679-685.
- Sekerak, A. D., and H. P. Arai. 1977. Some metazoan parasites of rockfishes of the genus *Sebastes* from the northeastern Pacific Ocean. *Syesis.*, 10:139-144.
- Woolcock, V. 1935. Digenetic trematodes from some Australian fishes. *Parasitology*, 27(3):309-311.
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